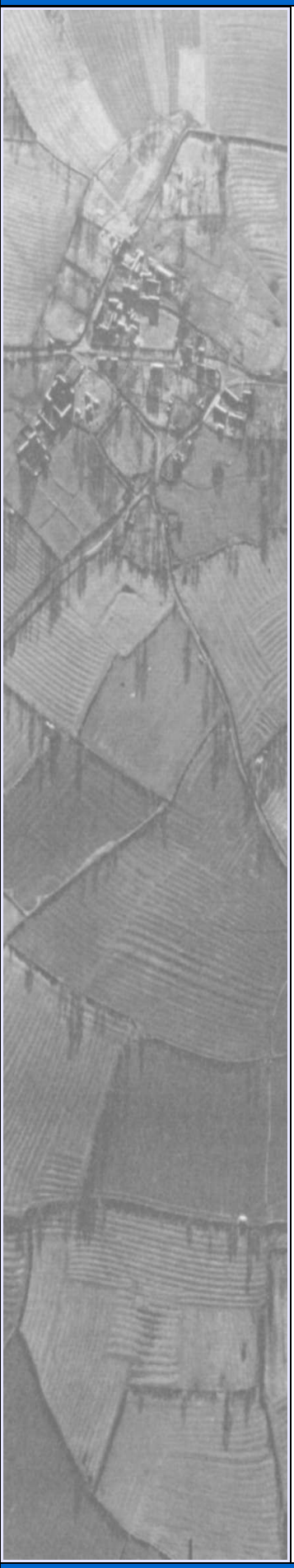


Steart Farm
Cheddar
Somerset

MAGNETOMETER SURVEY REPORT

for

WYG Environment Planning Transport Ltd

David Sabin and Kerry Donaldson

August 2012

Ref. no. 424

ARCHAEOLOGICAL SURVEYS LTD

Steart Farm
Cheddar
Somerset

Magnetometer Survey

for

WYG Environment Planning Transport Ltd

Fieldwork by David Sabin and Jack Cousins
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey date – **9th August 2012**
Ordnance Survey Grid Reference – **ST 45200 52850**

Archaeological Surveys Ltd
PO Box 2862, Chippenham, Wiltshire, SN14 7WZ
Tel: 01249 782234 Fax: 0871 661 8804
Email: info@archaeological-surveys.co.uk
Web: www.archaeological-surveys.co.uk

CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

A magnetometer survey was carried out over approximately 3ha at Steart Farm, Cheddar, Somerset. The work was carried out by Archaeological Surveys Ltd and commissioned by WYG as part of an archaeological assessment of the site ahead of a proposed supermarket development. The results indicated the presence of a number of very weakly positive linear and amorphous anomalies within the site. The majority of these are very weak (<1nT) and fragmented and as a consequence their origin cannot be confidently interpreted. It is possible that some anomalies within the southern part of the site (Area 2) may relate to natural features. The survey located many land drains associated with agricultural improvements.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by WYG to undertake a magnetometer survey of an area of land at Steart Farm, Cheddar, Somerset. The site has been outlined for the proposed development of a supermarket. The survey forms part of an archaeological assessment of the site.

1.1.2 The geophysical survey was carried out in accordance with a project design with the specification prepared by Martin Brown, Principal Archaeologist at WYG (2012a), in consultation with Stephen Membery, Development Control Archaeologist for Somerset County Council.

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin, so that they may be assessed prior to development of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 The survey and report generally follow the recommendations set out by: English Heritage (2008) *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Institute for Archaeologists (2011) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3 Site location, description and survey conditions

1.3.1 The site is located at Steart Farm on the south western edge of Cheddar in Somerset. It is centred on Ordnance Survey National Grid Reference (OS NGR) ST 45200 52850, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 3ha of pasture land within two fields. A small orchard immediately to the north was unsuitable for survey due to the presence of fallen and extant trees. The land was generally flat or very gently sloping down towards the south. A small area of very waterlogged land was encountered within the north western part of Area 1.

1.3.3 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data as long grass had been recently topped and grazed. Waterlogged land in the north western part of the site was unsurveyable, and ferrous objects within and adjacent to the survey area were noted as sources of magnetic disturbance. The weather during the survey was fine and sunny.

1.4 Site history and archaeological potential

1.4.1 An Archaeological and Heritage Desk-Based Assessment has been compiled by WYG (2012b). It outlines that Romano British pottery fragments have been recorded within the survey area, and Roman ditches were located during an evaluation of the industrial estate to the east. The Scheduled Monument (1017290) that includes a Roman settlement, Anglo Saxon and Norman Royal palace and St Columbanus' Chapel, is located approximately 300m east of the site. There is, therefore, some potential for the geophysical survey to locate anomalies that may relate to archaeological features within the site.

1.5 Geology and soils

1.5.1 The underlying geology is Mercia Mudstone with overlying tidal flat deposits of clay, silt and sand (BGS, 2012).

1.5.2 The overlying soils across the site are from the Compton association which are pelo-alluvial gley soils. These consist of stoneless, mostly reddish clayey soils affected by groundwater (Soil Survey of England and Wales, 1983).

1.5.3 Mercia mudstone and alluvial deposits can result in suppressed magnetic susceptibility and as a consequence anomalies may be of low contrast.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

2.1.2 Iron minerals within the soil may become altered by burning and the break

down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using Bartington Grad 601-2 gradiometers. The instruments effectively measure a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally.

2.2.2 The instruments are extremely sensitive and are able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to ±100nT when surveying with the highest sensitivity. All readings are saved to an integral data logger for analysis and presentation.

2.2.3 The instruments are operated according to the manufacturer's instructions with consideration given to the local conditions. An adjustment procedure is required, prior to collection of data, in order to balance the sensors and remove the effects of the Earth's magnetic field; further adjustment is required during the survey due to instrument drift often associated with temperature change.

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

2.2.5 The Bartington gradiometers undergo regular servicing and calibration by the manufacturer. A current assessment of the instruments is shown in Table 1 below.

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 084, 085, 242 and 396
Date of certified calibration/service	Sensors 084 and 085 - 6th August 2010 (due Aug 2012) Sensors 242 and 396 - 14th October 2011 (due Oct 2013)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instruments were considered to be in good working order prior to the survey, with no known faults or defects.

2.2.6 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids (900m²) giving 3600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).

2.2.7 The survey grids were set out to the Ordnance Survey OSGB36 datum using a Penmap RTK GPS. The GPS is used in conjunction with Leica's SmartNet service, where positional corrections are sent via a mobile telephone link. Positional accuracy of around 10 – 20mm is possible using the system. The instrument is regularly checked against the ETRS89 reference framework using Ordnance Survey ground marker C1ST7784 (Horton).

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are analysed and processed in specialist software known as ArcheoSurveyor. The software allows greyscale and trace plots to be produced for presentation and display. Survey grids are assembled to form an overall composite of data (composite file) creating a dataset of the complete survey area. Appendix C contains specific information concerning the survey and data attributes and is derived directly from ArcheoSurveyor; this should be used in conjunction with information provided by Figure 02.

2.3.2 Only minimal processing is carried out in order to enhance the results of the survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey:

- clipping of the raw data at ±30nT to improve greyscale resolution,
- clipping of processed data at ±3nT to enhance low magnitude anomalies,
- zero median/mean traverse is applied in order to balance readings along each traverse.

Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used for each survey area.

2.3.3 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within each survey area.

2.3.4 The main form of data display prepared for this report is the greyscale plot. Both 'raw' and 'processed' data have been shown followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.3.5 Graphic raster images in bitmap format (.BMP) are initially prepared in ArcheoSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by ArcheoSurveyor from left to right; this corresponds to a direction of south to north in the field. Prior to displaying against base mapping, raster graphics require a rotation of 90° anticlockwise to restore north to the top of the image upon insertion into AutoCAD.

2.3.6 The raster images are combined with base mapping using ProgeCAD Professional 2009 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method etc.

2.3.7 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results

3.1.1 The detailed magnetic survey was carried out over a total of two survey areas covering approximately 3ha. For the purposes of this report, these are referred to as Areas 1 and 2, see Figure 02. Survey within Area 2 was carried out using two different orientations and the resultant datasets are referred to as Areas 2a and 2b representing the western strip and northern strip respectively.

3.1.2 Magnetic anomalies located can be generally classified as positive anomalies of an uncertain origin, linear anomalies relating to land management, areas of magnetic debris and disturbance and strong discrete dipolar anomalies relating to ferrous objects.

3.2 Statement of data quality

3.2.1 Data are considered representative of the magnetic conditions present across the site. No significant defects are present within the dataset. However, it should be noted that severe magnetic disturbance was encountered along the eastern and north western sides of Area 1. The disturbance was caused by steel-framed agricultural and industrial buildings, and it has the potential to obscure anomalies of low magnitude.

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	**Description and origin of anomalies**
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG POS AREA UNCERTAIN 	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies relating to land management AS-ABST MAG LAND DRAIN	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates a ceramic land drain.
Anomalies associated with magnetic debris AS-ABST MAG DEBRIS AS-ABST MAG STRONG DIPOLAR 	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, or hearths and may therefore be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.

Anomalies with a modern origin AS-ABST MAG DISTURBANCE	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around such features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 2: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 345225 152880, see Figures 03 – 05.

Anomalies with an uncertain origin

(1) – Two weakly positive, parallel anomalies located in the south western corner of Area 1. These anomalies are less than 1nT in strength, and do not form a coherent pattern. Although a response to weakly magnetically enhanced material, the origin of these anomalies is not certain.

(2) – Weak, and short linear and possible curvilinear anomalies within the western part of the survey area.

(3) – The survey area contains several very weakly positive linear anomalies. The response is generally less than 0.5nT and they are unclear within the data.

Anomalies associated with land management

(4) – A series of parallel linear anomalies extend along the length of the survey area. It would appear that these relate to land drains.

Anomalies associated with magnetic debris

(5) – The site contains numerous and widespread strong discrete dipolar anomalies. These are a response to ferrous objects within the topsoil.

Anomalies with a modern origin

(6) – The eastern and north western edges are affected by magnetic disturbance from adjacent steel-framed buildings within the industrial estate and farm.

3.5 List of anomalies - Area 2

Area centred on OS NGR 345130 152750, see Figures 03 – 05.

Anomalies with an uncertain origin

(7) – Extending roughly parallel with the western field boundary are several weakly positive responses. They appear broadly linear with some discrete patches and although may indicate areas of magnetic enhancement their origin is uncertain. It is not clear if these are anthropogenic or relate to natural features.

(8) – Weakly positive linear anomalies extend roughly parallel with the western field boundary. These weak and fragmented anomalies may indicate ditch-like features; however, their origin is uncertain.

(9) – Located close to the north eastern corner of Area 2 are a positive linear and possible discrete anomaly. These anomalies are up to 5nT in strength indicating that they encompass magnetically enhanced material. However, given that they appear to extend beyond the limit of the survey area their origin cannot be confidently determined.

Anomalies associated with land management

(10) – Several multiple dipolar linear anomalies are located in the southern part of Area 2. It appears that these relate to ceramic land drains.

Anomalies associated with magnetic debris

(11) – Small patches of magnetic debris are evident close to the western hedge. This type of response may indicate ferrous material used for ground consolidation and/or areas of burning.

Anomalies with a modern origin

(12) – Magnetic disturbance in the northern part of the survey area is a response to an electricity pole support and also possibly a pipeline running along the northern ditch or hedgeline.

4 CONCLUSION

4.1.1 The detailed magnetometer survey located a number of very weakly positive linear and amorphous anomalies within the site. The majority of these are very weak (<1nT) and fragmented and as a consequence their origin cannot be confidently interpreted. It is possible that some anomalies within the southern part of the site (Area 2) may relate to natural features.

4.1.2 Widespread evidence of land drainage associated with agriculture may indicate that the land is subject to periodic waterlogging. With the northern part of the site immediately north of moors and levels, it is likely that drainage improvements have been carried out over a long period of time to improve agricultural prospects.

5 REFERENCES

British Geological Survey, 2012. *Geology of Britain viewer, 1:50 000 scale [online]* available from http://maps.bgs.ac.uk/geologyviewer/ [accessed 14/8/2012].

English Heritage, 2008. *Geophysical survey in archaeological field evaluation. Research and Professional Service Guideline No.1.* 2nd ed. Swindon: English Heritage.

Institute for Archaeologists, 2002. *The use of Geophysical Techniques in Archaeological Evaluations*. IfA Paper No. 6. IfA, University of Reading.

Institute for Archaeologists, 2011. *Standard and Guidance for archaeological geophysical survey*. IfA, University of Reading.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 5 South West England.*

WYG, 2012a. *Sainsbury's Supermarkets Ltd, Steart Farm, Cheddar, Somerset. Project Design for Geophysical Survey.* Unpublished typescript document.

WYG, 2012b. *Sainsbury's Supermarkets Ltd, Steart Farm, Cheddar, Somerset. Proposed New Foodstore. Archaeology and Heritage Desk-Based Assessment* Unpublished typescript document.

Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material.

Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field.

Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±5nT and ±1nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

De-stagger

Compensates for small positional errors within data collection by shifting the position of the readings along each traverse by a specified amount. Data lost at the end of each traverse are extrapolated from adjacent value in the same row.

Deslope

Corrects for striping and distortion caused by metal objects/services etc.. The process calculates a curve based on a polynomial best fit mathematical function for each traverse. This curve is then subtracted from the actual data.

Edge Match

Calculates the mean of the 2 lines (rows or columns) of data either side of the edge to match. It then subtracts the difference between the means from all datapoints in the selected area.

FFT (Fast Fourier Transform) spectral filtering

A mathematical process used to determine the frequency components of a traverse. Repetitive features, such as plough marks, produce characteristic spectral zones that can be suppressed allowing greyscale images to appear clearer.

Appendix C – survey and data information

Area 1 raw magnetometer data

COMPOSITE
Filename: J424-mag-Area1-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 10/08/2012
Assembled by: on 14/08/2012
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702.00

Dimensions
Composite Size (readings): 720 x 180
Survey Size (meters): 180.00m x 180.00 m
Grid Size: 30.00 m x 30.00 m
X Interval: 0.25 m
Y Interval: 1.00 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 8.03
Mean: 1.96
Median: 0.07
Composite Area: 3.24 ha
Surveyed Area: 1.71 ha

PROGRAM
Name: ArcheoSurveyor
Version: 2.5.16.0

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 30
1 Col:0 Row:0 grids\19.xgd
2 Col:0 Row:1 grids\20.xgd
3 Col:0 Row:2 grids\21.xgd
4 Col:0 Row:3 grids\01.xgd
5 Col:0 Row:4 grids\02.xgd
6 Col:0 Row:5 grids\03.xgd
7 Col:1 Row:0 grids\22.xgd
8 Col:1 Row:1 grids\23.xgd
9 Col:1 Row:2 grids\24.xgd
10 Col:1 Row:3 grids\04.xgd
11 Col:1 Row:4 grids\05.xgd
12 Col:1 Row:5 grids\06.xgd
13 Col:2 Row:0 grids\25.xgd
14 Col:2 Row:1 grids\26.xgd
15 Col:2 Row:2 grids\27.xgd
16 Col:2 Row:3 grids\07.xgd
17 Col:2 Row:4 grids\08.xgd
18 Col:2 Row:5 grids\09.xgd
19 Col:3 Row:1 grids\28.xgd
20 Col:3 Row:2 grids\29.xgd
21 Col:3 Row:3 grids\10.xgd
22 Col:3 Row:4 grids\11.xgd
23 Col:3 Row:5 grids\12.xgd
24 Col:4 Row:2 grids\30.xgd
25 Col:4 Row:3 grids\13.xgd
26 Col:4 Row:4 grids\14.xgd
27 Col:4 Row:5 grids\15.xgd
28 Col:5 Row:3 grids\16.xgd
29 Col:5 Row:4 grids\17.xgd
30 Col:5 Row:5 grids\18.xgd

Area 1 processed magnetometer data

COMPOSITE
Filename: J424-mag-Area1-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.67
Mean: 0.30
Median: 0.03
Composite Area: 3.24 ha
Surveyed Area: 1.71 ha

Processes: 32
1 Base Layer
2 DeStripe Median Traverse: Grids: 23.xgd 26.xgd
3 DeStripe Median Traverse: Grids: 04.xgd 07.xgd
4 DeStripe Median Traverse: Grids: 27.xgd
5 DeStripe Median Traverse: Grids: 24.xgd
6 DeStripe Median Traverse: Grids: 22.xgd
7 DeStripe Median Traverse: Grids: 25.xgd
8 DeStripe Mean Traverse: Grids: 05.xgd Threshold: 1 SDs
9 DeStripe Mean Traverse: Grids: 10.xgd Threshold: 0.25 SDs
10 DeStripe Mean Traverse: Grids: 29.xgd Threshold: 0.25 SDs
11 DeStripe Mean Traverse: Grids: 28.xgd Threshold: 0.25 SDs
12 Edge Match (Area: Top 90, Left 360, Bottom 119, Right 479) to Left edge
13 Edge Match (Area: Top 60, Left 360, Bottom 89, Right 479) to Left edge
14 Edge Match (Area: Top 30, Left 360, Bottom 59, Right 479) to Left edge
15 DeStripe Median Sensors: 08.xgd
16 Edge Match (Area: Top 120, Left 240, Bottom 149, Right 359) to Top edge
17 DeStripe Median Sensors: 11.xgd
18 Edge Match (Area: Top 120, Left 360, Bottom 149, Right 479) to Left edge
19 DeStripe Median Sensors: 13.xgd
20 DeStripe Median Sensors: 14.xgd
21 Edge Match (Area: Top 120, Left 480, Bottom 149, Right 599) to Top edge
22 DeStripe Median Sensors: 14.xgd
23 DeStripe Median Sensors: 11.xgd
24 DeStripe Median Sensors: 08.xgd
25 DeStripe Median Sensors: 17.xgd
26 DeStripe Median Sensors: 06.xgd
27 Edge Match (Area: Top 150, Left 120, Bottom 179, Right 239) to Top edge
28 DeStripe Median Sensors: 18.xgd
29 DeStripe Median Sensors: 15.xgd
30 Edge Match (Area: Top 150, Left 480, Bottom 179, Right 599) to Top edge
31 Edge Match (Area: Top 150, Left 600, Bottom 179, Right 719) to Top edge
32 Clip from -3.00 to 3.00 nT

Area 2a raw magnetometer data

COMPOSITE
Filename: J424-mag-Area2a-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 10/08/2012
Assembled by: on 14/08/2012
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702.00

Dimensions
Composite Size (readings): 240 x 210
Survey Size (meters): 60.00m x 210.00 m
Grid Size: 30.00 m x 30.00 m
X Interval: 0.25 m
Y Interval: 1.00 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 2.82
Mean: -0.86
Median: -0.67
Composite Area: 1.26 ha
Surveyed Area: 0.74 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT Processes: 2

Source Grids: 13
1 Col:0 Row:0 grids\04.xgd
2 Col:0 Row:1 grids\05.xgd
3 Col:0 Row:2 grids\06.xgd
4 Col:0 Row:3 grids\07.xgd
5 Col:0 Row:4 grids\08.xgd
6 Col:0 Row:5 grids\09.xgd
7 Col:0 Row:6 grids\10.xgd
8 Col:1 Row:0 grids\01.xgd
9 Col:1 Row:1 grids\02.xgd
10 Col:1 Row:2 grids\03.xgd
11 Col:1 Row:3 grids\11.xgd
12 Col:1 Row:4 grids\12.xgd
13 Col:1 Row:5 grids\13.xgd

Area 2a processed magnetometer data

COMPOSITE
Filename: J424-mag-Area2a-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 0.91
Mean: -0.04
Median: -0.01
Composite Area: 1.26 ha
Surveyed Area: 0.73 ha

Processes: 11
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Mean Traverse: Grids: All Threshold: 1 SDs
4 DeStripe Median Traverse: Grids: 08.xgd 09.xgd 10.xgd
5 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 153, Left 194, Bottom 179, Right 224)
6 DeStripe Median Traverse: Grids: 13.xgd

7 Clip from -3.00 to 3.00 nT
8 De Stagger: Grids: 08.xgd Mode: Both By: 1 intervals
9 De Stagger: Grids: 07.xgd Mode: Both By: 1 intervals
10 De Stagger: Grids: 13.xgd Mode: Both By: 1 intervals
11 Clip from -3.00 to 3.00 nT

Area 2b raw magnetometer data

COMPOSITE
Filename: J424-mag-Area2b-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 09/08/2012
Assembled by: on 14/08/2012
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702.00

Dimensions
Composite Size (readings): 120 x 120
Survey Size (meters): 30.00m x 120.00 m
Grid Size: 30.00 m x 30.00 m
X Interval: 0.25 m
Y Interval: 1.00 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 4.65
Mean: -2.05
Median: -1.33
Composite Area: 0.36 ha
Surveyed Area: 0.17 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 4
1 Col:0 Row:0 grids\01.xgd
2 Col:0 Row:1 grids\02.xgd
3 Col:0 Row:2 grids\03.xgd
4 Col:0 Row:3 grids\04.xgd

Area 2b processed magnetometer data

COMPOSITE
Filename: J424-mag-Area2b-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.30
Mean: -0.17
Median: 0.00
Composite Area: 0.36 ha
Surveyed Area: 0.17 ha

Processes: 4
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Median Traverse: Grids: All
4 Clip from -3.00 to 3.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at Castle Combe, Wiltshire (see inside cover for address). Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site.

Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). The distribution of both hardcopy report and digital data is considered the responsibility of the Client unless explicitly stated in the survey Brief, Written Scheme of Investigation or other contractual agreement.

This report has been prepared using the following software on a Windows XP platform:

- ArcheoSurveyor version 2.5.16.0 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data produced by the survey and report include the following files:

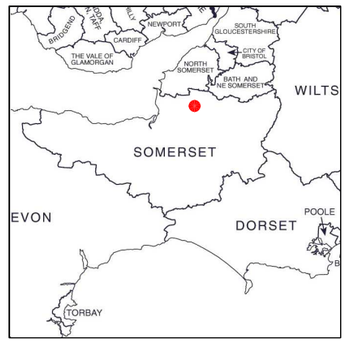
- ArcheoSurveyor grid and composite files for all geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as rich text format (RTF),
- report text as PDF,
- PDFs of all figures.

Survey location

Archaeological Surveys Ltd

Geophysical Survey
Steart Farm
Cheddar
Somerset

Map of survey area



Survey location

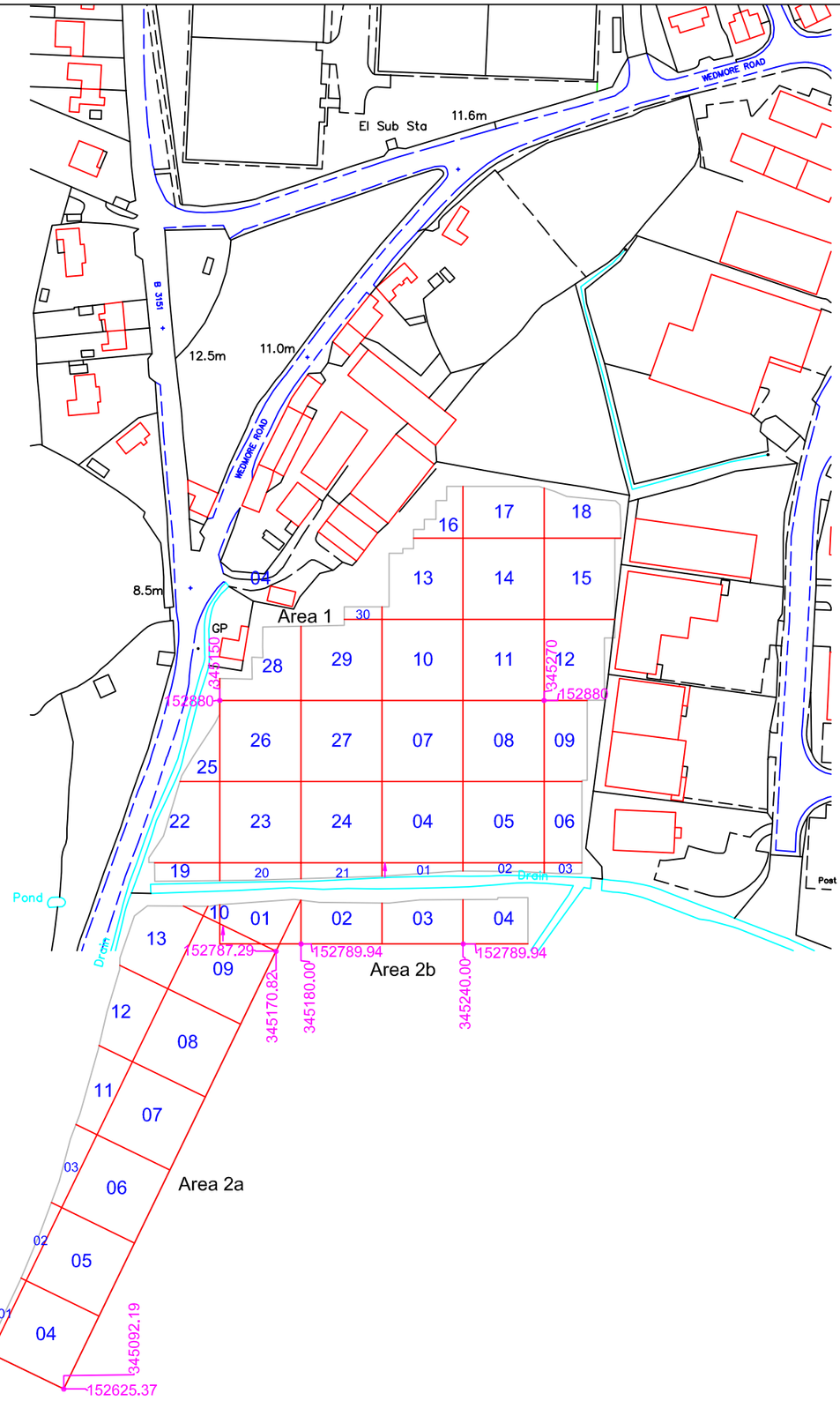
Site centred on OS NGR
ST 452 528

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01



Archaeological Surveys Ltd

Geophysical Survey
Steart Farm
Cheddar
Somerset

Referencing information

Grid coordinates based on Ordnance Survey OSGB36 datum

Grids set out using RTK GPS with Leica SmartNet correction data RTCMv2 format OSTN02 transformation

Survey grid size = 30m

Survey start and traverse direction

01 Grid reference number and filename

SCALE 1:2000

0m 20 40 60 80 100m

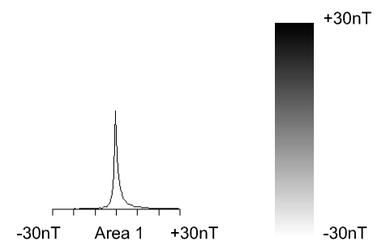
SCALE TRUE AT A3

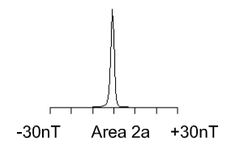
FIG 02

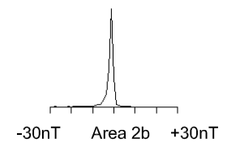
Archaeological Surveys Ltd

Geophysical Survey
Steart Farm
Cheddar
Somerset

Greyscale plot of raw magnetometer data







SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 03

Steart Cottage

WEDMOR

8.5m

GP

Area 1

1a

2a

3

N

Pond

Drain

Area 2

Archaeological Surveys Ltd

Geophysical Survey
Steart Farm
Cheddar
Somerset

Greyscale plot of processed magnetometer data

+3nT

-3nT

-3nT Area 1 +3nT

-3nT Area 2a +3nT

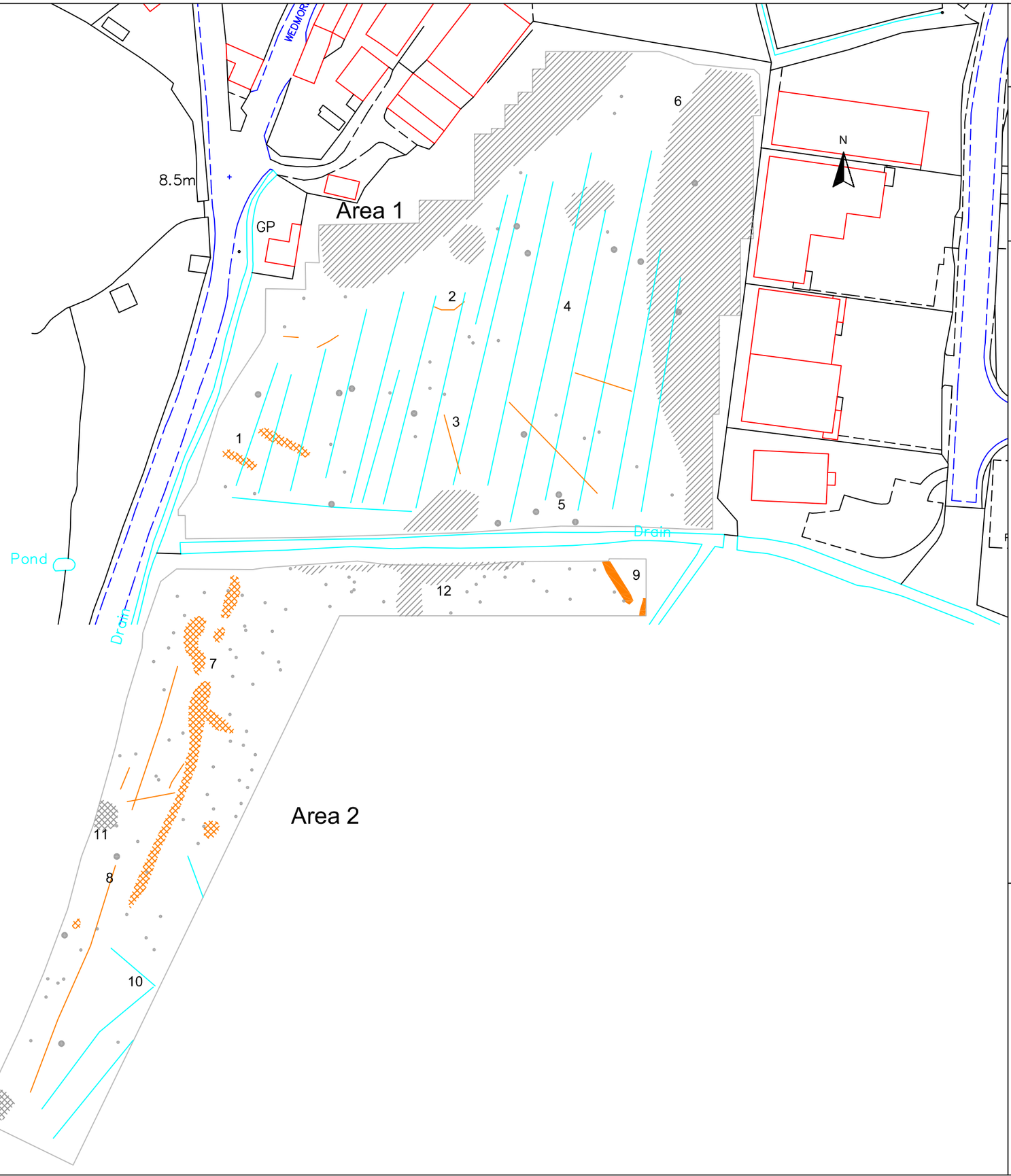
-3nT Area 2b +3nT

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 04



Archaeological Surveys Ltd

Geophysical Survey
Steart Farm
Cheddar
Somerset

Abstraction and interpretation of magnetometer anomalies

- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible land drain
- Positive anomaly - magnetically enhanced material
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05